History of Automation and Information Technology
at the University of Hawai'i at Manoa Libraries

About names and images: see appendix for names of individuals associated with the titles mentioned in this document; images are from author's personal files, promotional materials, advertisements and web sites—fair use only is intended, any concerns should be addressed to the author: Martha Chantiny

With respect to automation, the University of Hawai'i at Manoa (UHM) Library followed a typical path: "automated" circulation via use of keypunch cards, becoming a member and connecting to OCLC (Online College Library Center) and RLIN (Research Libraries Information Network) centralized, shared bibliographic systems to acquire or create bibliographic records, "retrospective conversion" projects to convert card catalog information to machine readable form, the creation of a microfiche catalog, acquisition of an OPAC (Online Public Access System), use of dialup search services, text-based internet access (Gopher, WAIS), optical disc electronic resources, Graphical User Interfaces (GUI) on microcomputers, the web and internet-based systems and services. The State of Hawai'i was involved with "high tech" initiatives in the early to mid-1980s which helped jump-start rapid automation activities in the University of Hawai'i (UH) libraries.

EARLY YEARS

The first automated library system was an offshoot of the new area of Electronic Data Processing (EDP) implemented in 1964 and described in a 1965 *College & Research Libraries* article written by Floyd M. Cammack, Assistant Librarian Sinclair Library, circa 1960-61, (http://scholarspace.manoa.hawaii.edu/handle/10125/24261). The system involved IBM punch cards, mainframe computer batch processing and off-line printing of reports:

> "To borrow a book which has already circulated through the new system, the borrower brings the book to the main circulation desk and presents it, with his personal identification card. The desk attendant inserts the borrower's card in the 1001 and slides the carriage into reading position. The information is read and transmitted in about three seconds to an 026 keypunch located in the circulation department... Next, the attendant removes the borrower's card and inserts the book card in the 1001 for reading in the same fashion. ... The attendant returns the book card to its pocket and the borrower's card to the borrower, inserts a date due slip in the pocket, and the transaction is complete."

There is some doubt as to the exact nature of the system that was used because a subsequent 1965 *College & Research Libraries* article (http://scholarspace.manoa.hawaii.edu/handle/10125/24263) written by Ralph R. Shaw, then Dean of Libraries at the University of Hawai'i, begins:

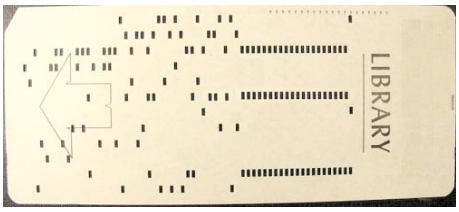
> "Regrettably it is necessary to set the record straight about the experiment in computer charging at the University of Hawai'i. The article purporting to deal with this topic in the May 1965 issue of CRL does not present an accurate account."

The article states that testing of the system [inaccurately described?] in the Cammack article was cancelled in May 1965 and replaced in June 1965 by "a simple charging system using an IBM 026 punch for about four hours per week and a tabulator at the Computer Center for about two hours per week". Apparently Mr. Cammack was an Associate Library Director during the tenure of the Library Director Carl Stroven who served from 1943 to 1966. When Ralph Shaw became Dean of Library Activities according to UH Library lore "he caused big changes, fired Cammack and threw out the punched cards system even though a significant number of circulating books had been automated in this fashion".

A sysem using keypunched cards and embossed library ID cards continued to be used into the 1970s. A long time librarian recalled it this way:

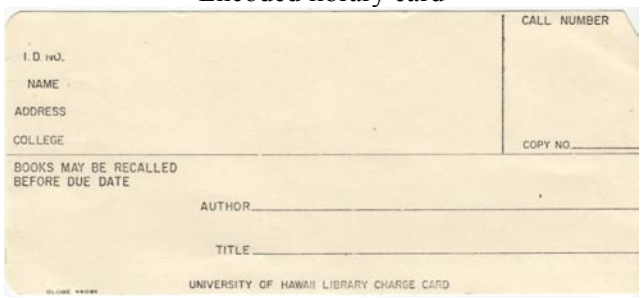
> "The borrower placed a plastic UH ID card into the open slot of an Addressograph machine; the slot was manually closed which caused pressure on the embossed info on the borrower card to be printed onto the IBM card in the upper left area. It made an impressive grinding noise. The borrower had already hand-written call number, author and title on the IBM card. […] huge wheeled metal trays were pushed from HL across to Keller Hall for the cards to be run through a machine in the computer department; then wheeled back to HL."

Card punch machine



Encoded library card

Library card embosser



Univ. of Hawaii checkout card

The UHM Library joined OCLC in June 1979 with the installation of 4 terminals (later expanded to 8 terminals) on a dedicated high-speed phone line connection to OCLC headquarters in Columbus, Ohio. The *OCLC NEWSLETTER* no. 124, August 13, 1979 reported on the dedication ceremony held June 1 to commemorate the University of Hawaii's participation in OCLC's on-line system:

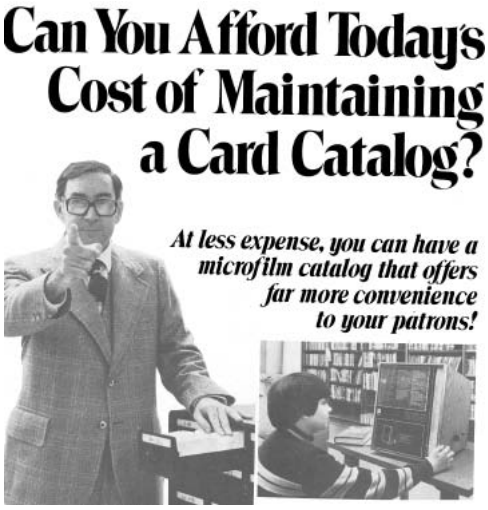
> "With flowered leis decorating each terminal and the special blessing of a Kahuna, the University of Hawai'i inaugurated its participation in OCLC on June 1. A large festively dressed group, which included State Librarian Ruth Itamura, a representative of other Island libraries, and the university administration, heard an address by Don Bosseau, University Librarian. Then Charles Kenn, an official 'Living Treasure of Hawai'i', gave a dedicatory prayer. An all-day feast and OCLC demonstration followed."

University of Hawaii staff watch demonstration of OCLC terminal.

The UHM Library established a Systems Office in the early 1980s to support automated library systems when they began to be used for cataloging processing operations: copy cataloging and original cataloging via OCLC and RLIN. The first "Systems Librarian" position was advertised in early 1982.

> JR OR ASSISTANT LIBRARY SPECIALIST. Library Systems Office, University of Hawai'i Library. Full-time, temporary position, general funds, to begin August 1982 through July 31, 1983. Possibility of conversion to permanent status at a future date. DUTIES: Work with Associate University Librarian for Processing Operations and Automation to implement and maintain on-line library computer systems; analyze, document and recommend changes in library procedures affected by move to automation, and contribute to the design of and supervise programming for library computer applications. MINIMUM QUALIFICATIONS for JR LIBRARY SPECIALIST: ALA accredited MLS, one year of library systems experience, knowledge of OCLC and MARC programming requirements. Desirable: Experience using COBOL, or PL/1 and SCRIPT, coursework in computerized applications. MINIMUM SALARY JR LIBRARY SPECIALIST: $1,348 per month. ADDITIONAL MINIMUM QUALIFICATIONS FOR ASSISTANT LIBRARY SPECIALIST: at least three years of professional experience in library automation, one year of graduate study in addition to the MLS, and extensive working experience with at least two programming languages one of which must be COBOL or PL/1. Desirable: Experience in training library staff and patrons to effectively utilize computer technology; experience in comparing commercial library-oriented computer offerings and the preparation of Requests for Proposals. MINIMUM SALARY FOR ASSISTANT LIBRARY SPECIALIST: $1,635 per month.

In 1983 the card catalog was "frozen" and all additions to the library catalog would be searchable only via a Computer Output Microfiche (COM) catalog. The reason for this was that the delay for filing of cards into the public catalog was estimated to be between 10 months and 2 years. The situation was described as follows: "People thought we did not have some of the books they wanted; some books circulated several times before their cards appeared in the catalog". The COM catalog microfiche were deployed in the library in late 1983 through 1985/86 (sets were distributed to Pacific Islands libraries for many years thereafter) in response not only to the backlog of unfiled cards but to the budgetary realities embodied in advertisements in library journals such as these:



Microfiche readers were placed near the card catalog and the fiche were alphabetically arranged in large binders next to the readers. A full set of fiche covering 1980-83 was produced from OCLC records that had been generated since the library began using it for online cataloging. The original set was followed by updates that had to be added to the binders, then periodically a new cumulative set of fiche was received. All of the previous set plus updates then had to be pulled out of the binders and the new fiche set inserted.

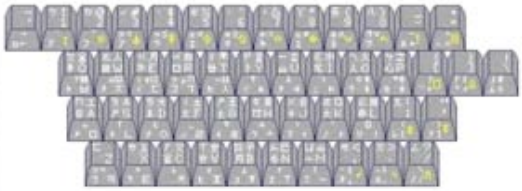
AUTOMATION BEGINS

Retrospective conversion projects were undertaken in the early 1980s, as the creation of online catalog databases became the "cutting edge" of library technology. A 1985 American Libraries article entitled *A "ReconExplosion" Is Offering New and Exciting Options* explained that the ALA Glossary defined it as "The process of converting to a machine-readable form the records in a manual or non-machine-readable file that are not converted through day-to day processing." The projects involved shipping catalog shelf-list cards to companies that matched LCCN (Library of Congress Card Numbers), titles, etc. to existing online databases. The Saztec Corporation (at that time located in Oregon, using outsourced labor in the Philippines) converted many records. Another batch of older materials was converted in 1989 by RLA (Retro-Link Associates) a Provo, Utah based company. The RLA contract included conversion of shelf list records in 40 languages, such as Japanese, Vietnamese, Korean, Russian, Chinese, French and Hindi. Some of the RLA conversion work was outsourced to Scotland. Near the end of 1989, RLA was acquired by Dynix, which was vying to provide CJK (Chinese-Japanese-Korean) capable OPACs in their library automation systems. In 1991 Research Libraries Group Inc. partnered with RLA to make its RLIN database available for retrospective conversion work. Meanwhile Dynix was in the process of merging with Ameritech as the library automation systems field began to consolidate.

The University of Hawai'i biennium budget for 1983-1985 ranked library automation as a high priority for funding. The first Systems Office consisted of one librarian and a library technician and computer science student programmers. Initial automation activities were limited to what could be accomplished using the University of Hawai'i Computing Center (UHCC) facilities – early program documentation was stored on disk packs and magnetic tapes. Hardware for library staff automation activities included special use terminals to access the OCLC bibliographic utility via dedicated dial-up connections, dumb terminals to access time-share computing (TSO) and the first email systems at the UHCC, impact dot matrix printers, and acoustic coupler dialup modems for on-line literature searching. The cataloging unit had 2-3 dedicated special purpose RLIN terminals to support CJK character display and input; each cost approximately $10,000.

OCLC terminal

VT52 dumb terminal



RLIN keyboard

Impact Printer

Acoustic coupler modem

The UHM Library began a search for an automated library system in 1983. The UH Board of Regents approved funding requests of $550,00 in FY83-84 and $75,000 in FY84-85 for the UHM Library Automation Program. The Library Automation Committee, expanded in 1985 to the Steering Committee for Library Automation (SCLAP) was created to evaluate systems and facilitate implementation. In April 1983 the University Librarian (UL) wrote to the Senate Committee on Higher Education to lobby for funding for the UH Budget request for Library Automation (UOH-104)[1]

1 […] "The University library supports the information needs of students, faculty, researchers, members of the professions, business, and individual citizens who require information beyond the level provided in general or popular publications. In 1981-82, 1.5 million persons used the services and collections of the University libraries. […] The State's economy is changing. […] Our industries, in order to survive and develop, require accurate and timely information […] In order for the University Library to provide the solid information base required by a fine university or an alive community and economy, it must automate. […] to acquire information in a more timely and cost efficient manner, to effectively offer collections and services, to link with new data base services, or to share information with research libraries and information services on the mainland or in the Orient. [...]"

In June 1983 the committee members attended the American Libraries Association Conference and viewed 8 demonstrations by automated systems vendors. Several of those vendors were invited to Hawai'i to perform onsite demonstrations.

In October 1983 the UL contacted all 4 of the Hawaii Congressional members (Representatives Akaka and Heftel, Senators Inouye and Matsunaga) to "propose that the Federal government provide 3.5 million dollars over the next three years to establish the University of Hawaii as an automated and modernized national and international information center for the Pacific" explaining that the UHM Library needed the funds to "support communications, software development, hardware, record conversion, and collection development". This avenue for obtaining "solid financial backing for the University of Hawaii Libraries project" did not materialize.

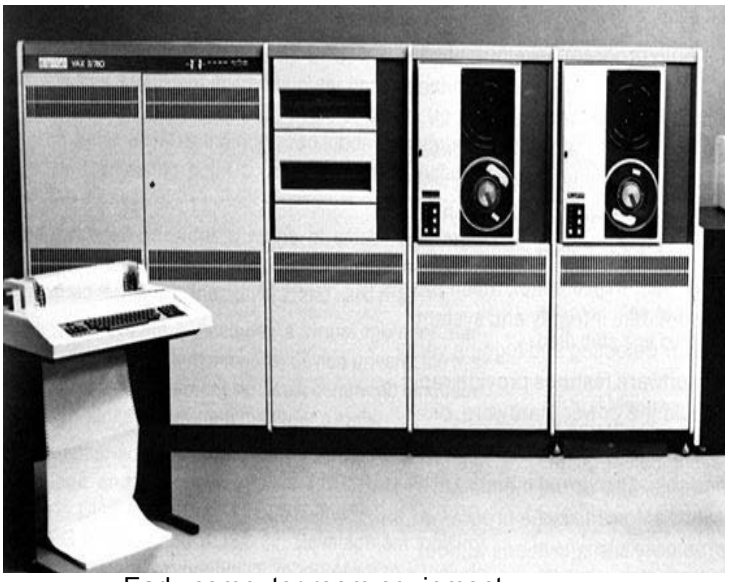
ALOHA (ADLIB)

The UHM Library took the somewhat daring step in 1984 of selecting the ALOHA system, becoming the first customer for the developer/vendor Advanced Library Systems. The initial automation software contract specified that ALL of the University of Hawai'i campus libraries would be covered and able to use the program if they chose to automate.

By December 1984, the Community College libraries were participating in the automation project. The agenda for the Third Community College Chancellor's Colloquium for Library Staff included sessions on "ADLIB: the online catalog module"; "computer hardware/software requirements"; "Conversion of the Card Catalog" and "Policy Implications for Community College Libraries". The integrated online public access, circulation, and cataloging system were designed expressly for the University of Hawai'i. The UHM Library saw this as a way to acquire an automated library system with the desired specialized functionality that did not exist in any established commercial systems of that time. As with each selection/change of automation vendor over the years, the "holy grail" was a desire for a system that could provide CJK vernacular character search, display and cataloging.

An in-house mainframe computer facility was constructed in the basement of Hamilton Library and in 1985 the ALOHA automated system was installed. Advanced Library Systems (later "ALC", later "Advanced Libraries and Information, Inc." aka "ALII") created the system as a joint development partnership with UHM Library. The ALOHA system ran on two VAX-type Ultimate mainframes[2] using the TCL program language and the Pick 'hash-file' data management system which was licensed to and implemented in about 1978 by a company called The Ultimate Corp. The Library's two mainframes were named "Bert" (live) and "Ernie" (backup). The original computer room looked something like the following image (photo courtesy of Digital Equipment Corporation).

2 Ultimate model 7200 32-bit CPU with 4 MB of main memory and support for 96 serial ports, with 6250 BPS tape drive, 8 disc drives with total 3.6 GB of storage, 300 lpm impact printer. As well as an Ultimate 1510 with 80MB of storage for "office automation" and in-house email functions.



Early computer room equipment

The method of connecting terminals located in technical processing and public areas with the mainframe computers in the basement was via a PACX (Private Automatic Computer eXchange) the name given by Gandalf Technologies to their data switching equipment. The UHM Library model was called the "Starmaster PACX 2000"; similar Gandalf equipment had already been installed in the UHCC in 1982. The connections were RS-232 serial interfaces over unshielded twisted-pair cabling. Signals were "multiplexed" via the Gandalf PACX. The UHCC installed fiber optic cabling at this time between the UHCC and the Library PACX and a Gandalf "Remote Shelf" was installed in Sinclair Library.

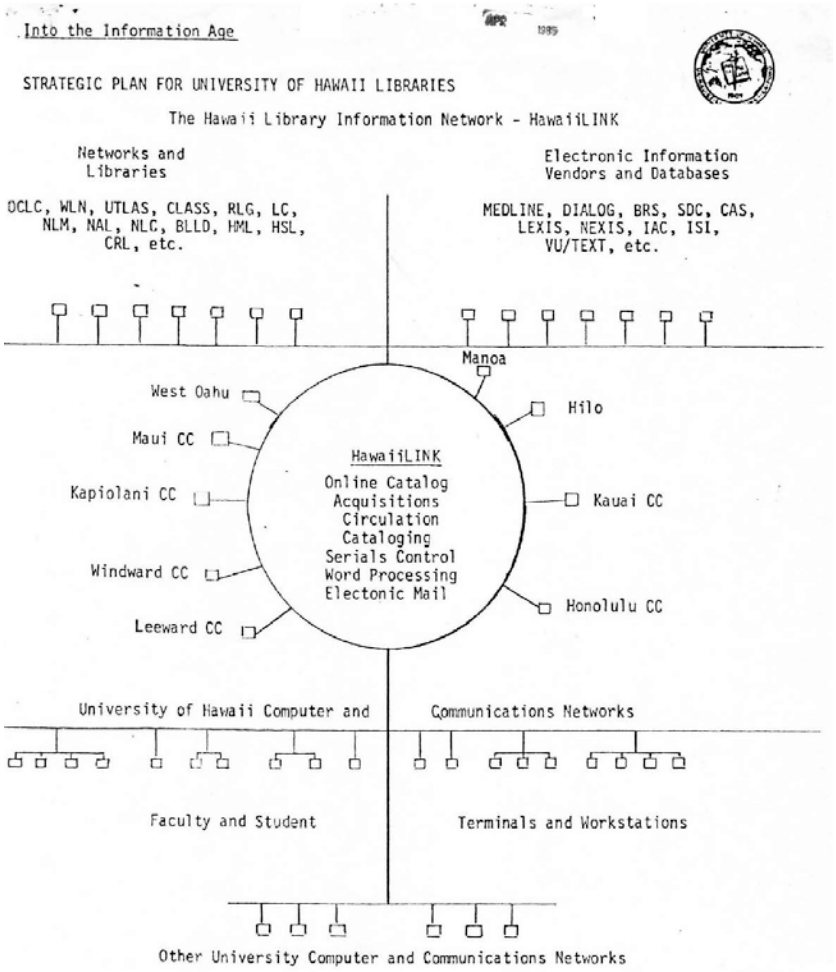
The Gandalf Company had a very distinctive logo and color-scheme (purple). The images below show an example of the logo from an early 1980 advertisement, however the library equipment more closely resembled the image on the right.

Gandalf PACX

The ALOHA programming team started out literally working in the Hamilton Library building and in a close relationship with the Library staff. ALOHA began with the OPAC (Online Public Access Catalog) and the most development was centered on the Cataloging module which was the underpinning of the OPAC. The other functions such as Circulation, Acquisitions and Serials were very basic and less stable. With the ALOHA system, each different library in the UH system that wished to automate had to purchase, house and maintain their own C-ITOH mini-computer equipment with their own separate database. The Community Colleges, UH Hilo and UH West Oahu used a scaled down version of the ALOHA system which was known as ADVANCE.

UNION DATABASE AND NETWORK

In 1985, a chart of the potential "Hawaii Library Information Network – HawaiiLINK" was circulated to show the possibilities for libraries moving "Into the Information Age". An important goal was to achieve a centralized system and eliminate the need for 8 separate sets of hardware, software and databases at each UH System site.

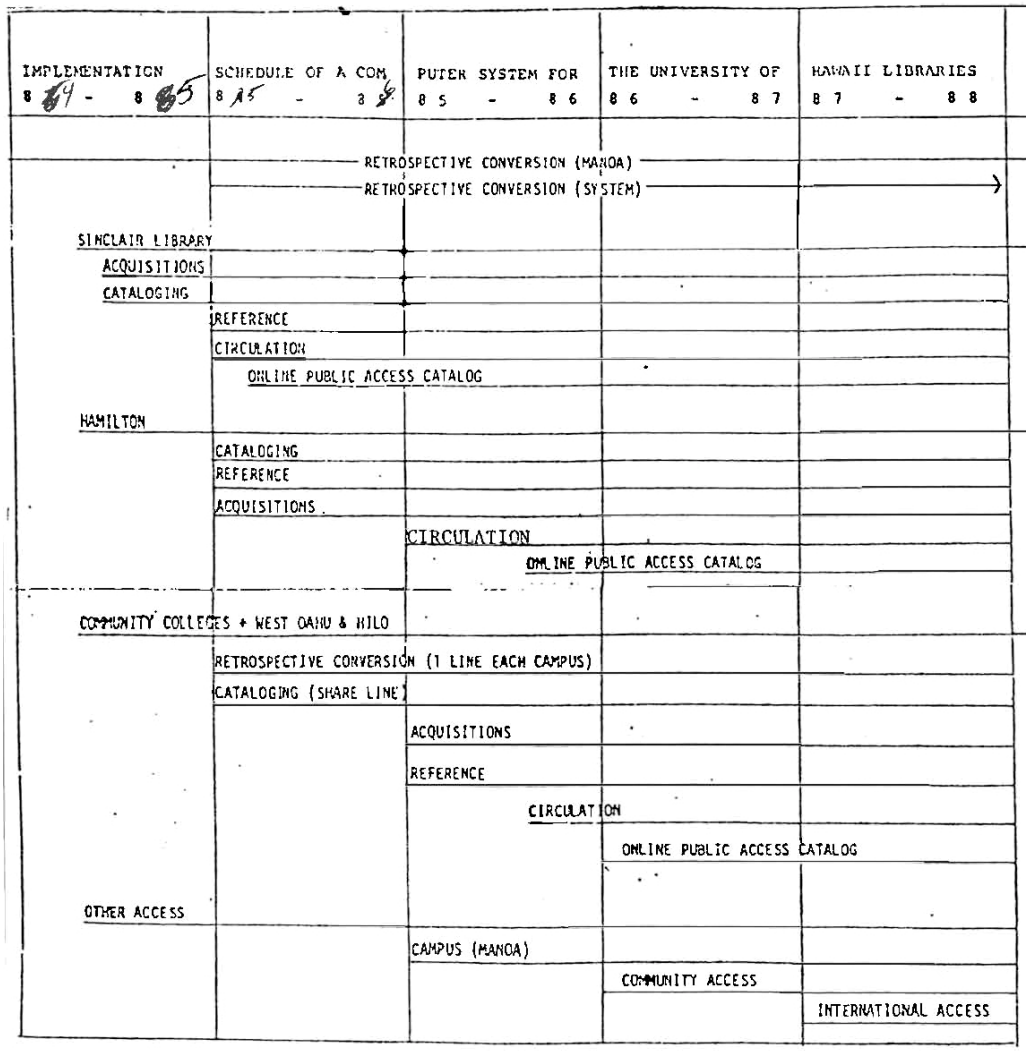


July 1985 the Chancellor for Community Colleges confirmed in a memo to the UHM Library UL that:

* The community colleges will pursue a "shared system" with UH Manoa
* This implies use of compatible hard and software with linkage through a union database and computer network
* Further, software developed for Manoa will be made available at no extra cost [...]
* The community colleges will establish a Task Force on Conversion and Implementation Planning

This set the stage for the UHM Library Systems Office to become the support locus for library automation for the entire UH System.

SCHEDULE FOR IMPLEMENTATION FOR AUTOMATION



In 1985 the Graduate School of Library Studies (located in Hamilton Library) began offering the Annual Automation Institute held during the summer session. The topics of the second Institute held in July 1987 were "Implementing and managing automated library systems" and "Implementing and managing automated circulation systems". By 1987, all newly received UHM Library materials were being processed online, and terminals replaced the card catalog for locating material.

The Systems Office had expanded to include a Computer Specialist, an Electronic Technician and 2 additional Systems Librarians. One of the new librarian positions was to provide liaison for planning and development between the ALOHA vendor and Library staff and train staff and public to use the new online system; the other was to implement and support "small/microcomputer systems".

MICROCOMPUTERS

As early as mid-1986 Library staff were becoming aware and interested in using microcomputers. Functions proposed for possible handling with microcomputer programs included: logs of memos, inventories, scheduling, compiling annual statistic reports, tracking of student payroll and creating signs and labels. A related collection management concern also arose - what to do with software acquired or donated to library collections or included with print acquisitions. Microcomputer-related issues were handled as an offshoot of the general automation activities managed by the Library Systems Office. There was no increase in budget or separate line item added to fund microcomputer hardware or software, funding came from the "Automation Supply/Software" category.

In February 1988 the Head of Systems explained in an email that: "The decision on what software to run is based on the study we had done by Todd Ogasawara[3] which was done after interviewing all the staff. [...] All public Service people were involved in this process and we discussed the recommendations extensively." The first meeting of the Public Services Microcomputer Council was convened on February 25, 1988; the group included the Division Head for Public Services as Chair, representatives from each public service unit (including Circulation) and the Small/microcomputer Systems librarian[4]. The charge to the group was to: "Define microcomputer related issues, processes, and procedures that specifically affect Public Services and Circulation. Work with Systems Office to make most efficient use of library microcomputer resources." Future plans for installation of a local area network (LAN) for library micros were discussed along with issues such as identifying and evaluating needs, communication, funding, training and equipment and product compatibility. These would be perennial and constant concerns for the next 3 decades.

A partnership established between the UHCC and the UHM Library resulted in the creation of a “major new workstation facility” which opened in February 1988 called the Computerized Learning and Information Center (CLIC). It was located in Sinclair Library in the former “Listening Center” and contained 25 z-29 (VT-100 compatible) terminals, 9 PLATO terminals, 16 Macintosh SE and 20 IBM PC microcomputers. Networking “to allow each workstation to access all central computing facilities (UHCC and Library systems) via the campus optical fiber backbone” was promised “as quickly as possible”. The UHCC Jan-Feb 1988 newsletter announcement stated “The Library will provide expertise on providing access to optical (CD-ROM) and remote information databases from workstations at CLIC.”

3 See: http://hdl.handle.net/10524/56873

4 In September 1989 the Council expanded to include representatives from Processing Operations and Automation (POA) division (Cataloging, Acquisitions, Serials)

E-RESOURCES: CD ROMS AND LANS

The first Library "e-resource" was an optical disk based system called Infotrac installed in the late 1980s. CDs for indexes and databases proliferated—boxes of them were kept at the Reference Desk and were checked out to each student to use on a PC with a CD-ROM reader. Many of the products were multiple disks, updated every month. The Serials department checked in the new disks and returned the superseded ones (incurring additional postage costs).

As computer-accessible data became ever more popular the CD disks were heavily used, sometimes becoming so scratched as to be unusable before the next update arrived. Reference librarians now had to check disks out and back in, teach people how to use the reader (e.g. where and how to insert them—some folks tried to put them into the 5" floppy drive) as well as the myriad different interfaces. Some departments switched to putting the most heavily used disks into stacks of chained external CD-drives to reduce constant disk swapping.

The Library hired a Collection Development Officer in 1988. He brought the concept of CD-ROM "jukebox" and networked systems to the attention of the Microcomputer Council in August 1988. This was an option presented as a way to solve service and reference issues which were expected when Hamilton Library closed during the summer of 1989 for a large asbestos removal project. During that time nearly 100 staff members and most services and operations were to be relocated to Sinclair Library.

The Library's first CD ROM LAN was a Multiplatter system from the company Silverplatter that utilized a Netware server and Ethernet connections.

Silverplatter MultiPlatter towers

A CD ROM Coordinating Committee was established in 1989 to address acquisition issues such as hardware requirements and patron access. The committee existed through 1992.

In June 1989, a 5-node MultiPlatter CD-ROM LAN was installed in CLIC at Sinclair Library, after the summer asbestos project the system was de-installed and re-installed with 3-nodes in the Humanities/Social Science Reference department in Hamilton Library.

Providing digital access to reference indexes and databases burgeoned quickly; so much so that Sinclair Library (at that time the Undergraduate Library) was reporting in October 1989 that the "freshman composition library instruction program has generated a heavy demand for access to the Readers' Guide Abstracts on CD-ROM. [...] students are using our one public workstation almost constantly during the day and evening."

In 1990, a second CD-ROM system, a peer-to-peer network using LANtastic software, was implemented in Sinclair Library. In 1991 the Multiplatter system was expanded 7 nodes and 11 drives and to include remote dialup connection from other UH Libraries. In 1992 a second Multiplatter system with remote dialup was installed in the Science and Technology reference department. Funding for some of the installations and expansions came from the UH campus "Alternative Delivery Fund" grants and other special funds.

To support the growing use of computer technology, including CD-ROM Local Area Networks (LAN), rapid changes in network technology and the need to enhance UHCARL software a second Electronics Technician and a second Computer Specialist were added to the Systems Office in 1990.

Over the next decade the UHM Library acquired hundreds of CD ROM-based resources that could not be networked due to technical or licensing issues. In 2000 the Library acquired a SuperCD-248 a network-attached CD-ROM server system from Axonix Corporation. At the time there were over 200 disks standalone CD databases that could be imaged and networked on the CD-server. Implementation of the system relieved the reference desk staff from having to check out and check back in an ever growing number of disks and patrons could search almost all the CD-based information from a single PC without having to borrow, insert, eject and return one disk at a time.

SuperCD disk player

Early UHM Library Goprint Paystation

DIAL-IN REMOTE ACCESS

Concurrent and entwined with the earliest UHM Library automation project there was a growing realization that the campus and state telecommunication technology and systems needed to be upgraded and expanded. In a November 22, 1983 memo to the University Advisory Committee on Libraries it was noted: “A major concern is that the campus be wired properly … An issue larger for UH than computing is the future of communication networks … we need capital improvement funds ”.

The earliest proposal for dial-in access to the UHM Library automated system was made in early 1985. It involved installing a dial-back modem attached to the library PACX connecting to the recently installed UHCC modem pool via a leased data line connected to 16-channel multiplexers at each end. By mid-1986 the UH Manoa campus was already planning the installation of a fiber optic data communications backbone driven primarily by the implementation of an online student registration system (ISIS). In November 1986 the UHM Graduate School of Library Studies offered a continuing education class taught by the UHM Library Systems Librarian called "Telecommunications for Libraries" which was an introduction to modems, multiplexers, the UHM campus network and "everyday data communications situations which face librarians".

The UHCC *Connections* newsletter for November 1987 announced "Remote access to OPAC for members of the University Community. All that is needed is a dumb terminal and access to UHCC [...] Access to this service will require that the user have an authorized ID and password. Remote access is scheduled for implementation on January 11th, 1988." Early dialin instructions for connection looked like this:

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UNIVERSITY OF HAWAII
STARMASTER.UHCC.HAWAII.EDU

Remote Access to the University of Hawaii Library Public Access Catalog (PAC)

COMMUNICATION PARAMETER SET UP:

        Before connecting, using a 80-column display terminal or personal
 computer with terminal emulation software, set your communications
 parameters to the following:
        Data bits:  7   Stop bits:  1   Parity:  Even OR whatever set of
 parameters are appropriate for connecting to your Internet Host computer.
        Terminal Emulation:  VT-100  (recommended, however other terminals
 or emulations may be selected from a menu after connecting).

CONNECTING/LOGGING ON:

1.              Telnet to the University of Hawaii Computing Center - telnet
                128.171.7.8.
                (or  telnet starmaster.uhcc.hawaii.edu)
2.              The UH Computing Center greeting will display, which
                concludes with the prompt:  "enter class".

                Then type LIB.  You should be routed directly to the Online
                Catalog.
3.              Select a terminal type from the menu to match the terminal you
                are using or the terminal emulation mode supported by your
                personal computer software. The most common choices have
                asterisks next to them.

 The terminal types available are:

        1)      ADM (all)
        2)      APPLE; IBM      <---- do NOT use
        3)      TANDEM          <---- use only from a TANDEM terminal, not a PC
        4)      TELE-914
        5)      VT100***
        6)      WYSE 50
        7)      ZENTEC
        8)      HARDCOPY***  Use HARDCOPY if your terminal type isn't listed

 SELECT LINE #:

       After selecting a terminal type, the following messages will appear:
                All set. When you are ready to exit the system, simply type
//EXIT, or hang up
Now, press return to enter the Public Access Catalog...

      The screen that will appear begins:

                >>>Systems That Inform<<<
                Welcome to the CARL System

 Press the Return or Enter key and the next screen will begin:

                ...WORKING...
                        ALOHA
       Welcome to the CARL PAC system at the University of Hawaii

DISCONNECTING/LOGGING OFF:
       Return to the Main Search Screen, or the initial Greeting Screen and
type //EXIT. You will then be disconnected from the UH Library and the UH
Computing Center.
       If you are not completely disconnected and the UH Computing Center
prompt ("enter class") appears, type BYE.
       Any problems or suggestions?  Please send e-mail to
       @uhunix.uhcc.hawaii.edu OR call the Hamilton Library Systems Office, at
(808) 956-7853, Monday-Friday, 8:00am-4:00pm.
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In 1987 the Hawaii State Legislature passed a resolution declaring 1988 "The Year of Telecommunication in Hawai'i. With the Telecommunications and Information Act (Act 1 SpSLH 1988) the Legislature appropriated funds for the development of the "University of Hawai'i Information Network" and the "State of Hawai'i Information Network Corporation".

In October 1988 a professor of Linguistics who was working with the UHCC to create help menus for the UHUNIX system approached the library with concerns about making the remote access experience easier to understand and use. His particular interests were mass downloading of labeled (field tagged) search results into bibliographic and database utilities (foreshadowing the development of bibliographic citation tools such as Endnote and Zotero). The question was raised as to whether it was time to "establish a new 'SCLAP', a campus-wide committee that can bring together people who want to improve our remote access services".

In November 1988 the UHM Library and PEACESAT (Pan-Pacific Education and Communication Experiments by Satellite) office set up the first free international connection to the library OPAC via the PEACESAT satellite as part of the "Pilot Project to demonstrate remote access to the UH Library Interactive Database (OPAC) to Academic Institutions in the Pacific Region"[5]

Funds for the expansion of the University of Hawai'i information network were authorized by the passage of the Telecommunications and Information Act of 1988 (Act 1 SpSLH, Section 14) to create the capacity to access information resources in other research libraries; to expand high speed communication links among University libraries and computing centers; to link University libraries to local, regional, national, and international databases; to convert University libraries' card catalogs and information files to machine readable form.[6] In 1989 the first trans-Pacific fiber-optic cable, Pacific Link, connected United States via Hawaii and Guam to Japan.

In 1990, the Legislative Management Act (Act 347 SLH 1990) appropriated funds to install "public access terminals" in all libraries of the University of Hawai'i System. The purpose of the Act was "to expand the number of public access terminals in public libraries and other state facilities to increase access to legislative information." The House of Representatives Bill for an Act which lead to Act 347 stated that "advances in telecommunications and information technology present significant opportunities for the State" and that the Act was designed to "encourage public and consumer education and awareness of [...] information services [...] promote the development of information services by the public sector" and to make government information services accessible to the public. Direct dial-up and Internet access via terminal emulation to the Library OPAC was made available in 1990-91.

In the Fall 1991 *Hawaii Library Association Journal* an update article touted the ability to search many remote databases from the UHCARL platform including the Hawaii Data Book, other CARL libraries, "the huge University of California system database" and the Uncover database, "an online index of articles from over 10,000 magazines and journals in all subject areas".

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5 Pacific Island Interactive Data Base Network Access: A PEACESAT, PICHTR, University of Hawaii Library Pilot Project http://hdl.handle.net/10125/49450

6 For more information about the University of Hawaii and Act 1 SpSLH see: *Information Services and Economic Development: New Opportunities for Collaboration* by John Haak, Helen B. Josephine & Glenn Miyata. Journal of Library Administration Volume 20, 1995 - Issue 3-4 http://dx.doi.org/10.1300/J111v20n03_05

1994 instructions for connecting to UHCARL looked like this:

UHCARL
Remote Access—Connecting/Disconnecting

Help with connection (modem rings but no answer/modem busy): 956-7351
Help with dial-in process: 956-7853

Use an 80-column display terminal or a personal computer and communication software with terminal emulation to access UHCARL.

Parameters

Before you connect to the UH Computing Center, set your communications parameters to:

Choice	Data bits	Stop bit	Parity
First:	**7**	**1**	**Even**
Second:	7	1	Space
Third:	8	1	None

Terminal Emulation

DEC VT-100 or Wyse 50 terminal emulation is recommended. You may connect utilizing other terminals or emulations and choose the appropriate choice from a menu (Step 3, below).

Baud Rate

300, 1200, 2400, or 9600 baud rates are available if using a modem. Any baud rate is acceptable if your equipment is directly connected to the UH Computing Center.

Connecting/Logging On

1. Connect to the UH Computing Center via a direct connection or with a phone line and modem. Modem phone number is:

956-9333

2. Immediately after the "*connected*" message or code sent by your modem appears on your screen, press the <Return> key until you see the UH Computing Center greeting which ends with the prompt: "*enter class:*". Type **`lib`** and press <Return>.

You should be routed directly to the UHCARL computer.

These messages may display:

3. Type a number for a TERMINAL TYPE from the menu which appears next and then press <Return>. Choose the type that matches the terminal or terminal emulation software you are using.

VT100 and HARDCOPY are the most commonly used types.

```
connection in progress


127360000
LIBRARY STARMASTER: Connected


*Welcome to the CARL system
Please identify your terminal. Choices are:
1.ADM (all)
2.APPLE,IBM
3.TANDEM
4.TELE-914
5.VT100
6.WYSE 50
7.ZENTEC
8.HARDCOPY
Use HARDCOPY if your terminal type isn't listed
SELECT LINE #:5
```

TELNET USERS: The UHCARL address via Telnet is: ***telnet uhcarl.lib***
(select LIB at the first screen you see and then proceed from step #3 in these instructions).

```
                    Aloha and Welcome

                        to the

                  UHCARL Library System

                        at the

                University of Hawaii, Manoa


          Developed by the Colorado Alliance of Research Libraries
              Marketed and supported by CARL Systems, Inc.
                        Denver, Colorado


Press <RETURN> to start session!  (Use  //EXIT  to return HOME.....)>>
```

After choosing a terminal type, the following messages appear:

```
All set. When you are ready to exit the
system, simply type //EXIT, or hang up.

Now, press return to enter the
Public Access Catalog...
```

When you press <Return>, the "Aloha and Welcome" screen appears with the instruction to "Press <RETURN> to start session."

```
                        A L O H A
      Welcome to the UH CARL Public Access Catalog (PAC)
          1. UH Manoa Library Catalog
          2. UH Manoa Library New Titles Lists
          3. UH Manoa Library News, Calendars and Policies
          4. UH System Library Catalogs
          5. In-State Libraries and Databases
          6. Periodical and Document Indexes (includes UnCover and ERIC)
          7. Out-of-State Libraries and Databases

    Enter the NUMBER of your choice, and press the <RETURN> key >> 1
```

The "Aloha" screen appears with the UHCARL main menu.

4. Type a line number to select a database.

For example:

Type **`1`**
(for "UH Manoa Library Catalog")
and press <Return>.

```
08/26/92
01:14 P.M.          SELECTED DATABASE:  UH Manoa Library

          The computer can find items by NAME or by WORD

          NAMES can be authors, editors, or names of
          persons or institutions written about in the book

          WORDS can be words from the title, or subjects,
          concepts, ideas, dates etc.

          You may also BROWSE by TITLE, CALL NUMBER, or SERIES.

          Enter   N   for  NAME search
                  W   for  WORD search
                  B   to   BROWSE by title, call number, or series
                  S   to   STOP or SWITCH to another database

          Type the letter for the search you want.
           and press <RETURN>.   or type  ?  for <HELP>

                     SELECTED DATABASE:  UH Manoa Library
ENTER  COMMAND (?H FOR HELP) >>  //EXIT
```

Disconnecting/Logging Off

1. At any screen, type ***`//EXIT`***
You will then be disconnected from the UH Computing Center.

2. If you see the *enter class:* prompt, type ***`BYE`*** to completely disconnect. Hang up your modem if you are using one and/or turn your terminal off.

By 1988, there were close to two million bibliographic records in the UHM Library online catalog; the wooden public card catalogs and all the paper cards were removed from the main floor of Hamilton Library. In 1988 the ALOHA system (now called ADVANCE) was bought by GEAC and there was uncertainty about the long-term support and survival of the product. In addition the number of records in the online catalog had outgrown the storage and indexing capacity of the original ALOHA system mainframe hardware and software. Greater networking capability and more software features were also needed in order to upgrade the Library's automated services. Meanwhile automation was expanding to include broader use of microcomputer systems in library units and in student education.

As a result, UHM Library wanted to acquire a new online Integrated Library System (ILS) that offered greater reliability, a broader range of processing software modules, and could be expanded to accommodate the databases of all UH System Libraries. Concurrently the State of Hawaii was looking for ways to encourage public/private partnerships to support building an information industry for economic development.[7]

In August 1989 the UHM Library prepared an update to the "Expenditure Plan for Funds" submitted in February as part of the University of Hawai'i proposal for funding from Section 14. In that document the use of information technologies in the library was described as having three phases: 1979-1983, the first phase, was designated "increasing productivity"; 1983-1989, the second phase, was described as "integration and extension" and the proposed third phase 1989-1992 was called "adding systems that inform and deliver".

A UH System-wide Technical Advisory Committee was formed in November 1989 at the behest of the University Librarian. The group was told that the UHM Library was "seriously considering the CARL Systems software as a supplement to or replacement for existing library software". The group was tasked with developing "telecommunications specifications for potential hardware acquisitions associated with the CARL Systems software to provide for effective connectivity to HAWAIIAN (The Hawaiian Area-Wide Information Access Network)[8], to the various University of Hawaii local and multi-campus networks, to the "research" network and for other networks as required by the Library and the University [and] to provide expert comment on computing hardware specifications proposed for the utilization of the CARL System."

7 *Creating an information industry in Hawaii: the State government's pro-active approach and its potential for success* by Ruth Marie Quirk and Linda Naj. 8th International Telecommunications Society Conference, Italy March 18-21, 1990. https://uhmanoa.lib.hawaii.edu/vwebv/holdingsInfo?bibId=573084&sk=manoa

8 Hawaii INC http://hdl.handle.net/10524/56936; See also Figure 1 page 32

A demonstration of the CARL system (originally developed for the Colorado Alliance of Research Libraries, now part of The Library Corporation) was scheduled onsite at UHM Library in October 1989. The CARL software was designed to run on TANDEM fault tolerant hardware. This was appealing because the ALOHA system and hardware had been unstable and subject to data corruption requiring lengthy (18 or more hours) restores from tape backups. There were a great number of concerns expressed by the UHM Library and Community College libraries staff with regard to what was demonstrated. The response from Kapiolani Community College Head Librarian[9] was indicative of the general sentiment:

> [...] The online catalog needs much more refinement, and the circulation screens and functions need significant revision. But the possibility of loading multiple databases on the catalog puts CARL ahead of other systems [...] and this feature is in line with the University's future plans. Also, the acquisitions and serials modules are fully developed, and in place [...] CARL seems to be developing into areas that are compatible not only with the most promising directions in library automation, but also with the University's future information strategies.

The negative reactions to the October 1989 demonstration were used as a basis for contract negotiation discussions between CARL and the UHM Library UL and Associate University Librarian for Processing, Operations and Automation (AUL POA). CARL was selected as the next ILS partly because the company agreed to develop and customize the circulation, reserves, and acquisitions module in partnership with the Library. More importantly, CARL was designed to allow many databases/libraries to share a single system yet each library could still have some differences in policies and functionality in a UH system-wide consortium.

The UHM Library used Act 1 funds to contract with the CARL Corporation to develop a customized system dubbed UHCARL, which would allow the library to network with other research libraries as well as to create a statewide University of Hawai'i library network. Migration from ALOHA to CARL began in 1990. A 4th librarian was added to the Systems Office at this time, originally to provide application support later changed to programming support.

The new automated UHCARL system was installed in spring 1990 on a Tandem 760 CLX minicomputer, later upgraded to a K1000 model. Systems Office staff coordinated the transfer of MARC bibliographic and holdings information from the ALOHA database to the CARL system and implementation of the first online Acquisitions and Serials processing modules. In 1991, the UHCARL Public Access Catalog, Bibliographic Maintenance, and Circulation software modules went live at the UH Manoa Library.

9 Memo from Terry Webb, dated October 23, 1989 to UL and AUL for POA

The CARL system was dumb-terminal based, the libraries used Wyse-50 and Wyse-60 terminals and dot-matrix or thinkjet "slave printers". The terminal displays were green or amber letters on a black background and they looked like this:

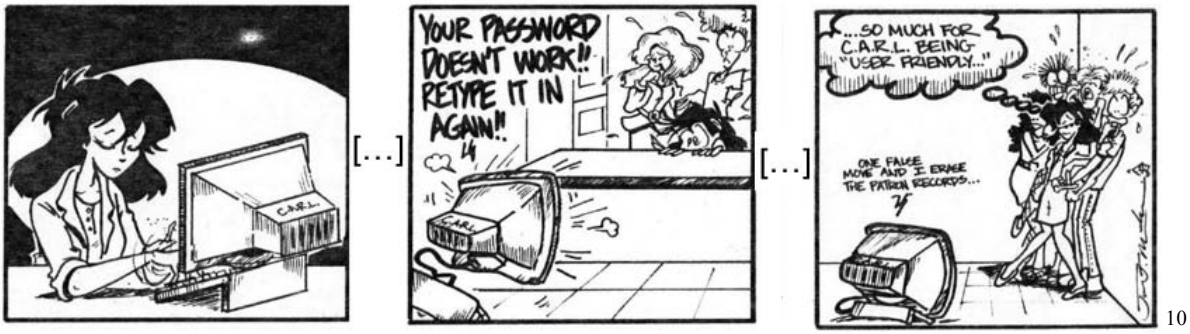
Wyse terminal

The librarians from Community Colleges, UH Hilo and West Oahu campuses had communicated a number of concerns to the UH Manoa Vice Chancellor for Administrative Affairs late in 1989. These included concerns about the telecommunication links between the sites and UHM Library, cost-sharing, maintenance contracts and need for a "much closer and much more effective working relationship between all the University libraries". Similar issues were brought to the attention of the Chancellor for Community Colleges in October 1990 after the Head Librarians had met with the two top executives of CARL and the UHM Library UL. Expansion of the Systems Office over the next 2 years was a result, in part, of a need to address those matters.

In 1991, migration of the UH Community College and other UH system libraries to the UHCARL platform centralized at UH Manoa Library began. Kapiolani Community College Library was the first to transfer their database and operations from the individual Geac ADVANCE mini-computer (C.Itoh hardware). In 1992, Hawai'i Medical Library and UH-Hilo Library moved their databases to UHCARL. In 1993, Maui Community College, Bishop Museum, and Kauai Community College Libraries followed; the UHM School of Law Library became a separate catalog on the UHCARL system.

The Bishop Museum incorporation into UHCARL included the first integration of non-bibliographic databases converted from microcomputer files. In mid-1993 two additional temporary applications support librarians were added to the Systems Office, paid via special funds from an assessment invoiced to the consortium member libraries.

The continuing development of the software, integration of multiple sites and configuring of consortial functions was tortuous at times. A student worker in the circulation unit, Jon J. Murakami, was an comic artist with the campus newspaper *Ka Leo* during this time. His "Library Use Only" series sometimes featured the challenges of working with the UHCARL system:



[10]

In 1994, Leeward Community College and West-Oahu Libraries came up on UHCARL followed by Windward Community College and Honolulu Community College. Two more temporary application support librarians were added to the Systems Office. By 1995 the UHCARL system included 10 libraries whose catalogs, as well as the ability to connect to information resources outside the state, were available from one PAC (Public Access Catalog) menu.

In 1995 the campus Information Technology Services (ITS) began installing network equipment and "backbone" infrastructure to convert the Library buildings to Ethernet-based data communication. This was necessary to be able to replace dumb terminals (connected via unshielded cabling to RS-232 terminal ports to the Gandalf Star master) to PCs that could connect to the "InterNet" via web browsers and to use other PC-based application. The Library router was configured so that the traffic from Ethernet datajack connections was sent directly to outside destinations to minimize impact on UHCARL system response time, which had been slowing dramatically under the load of all the consortium library connections.

By early 1995 the Systems Office consisted of 8 permanent positions and 4 temporary positions: the unit Librarian Department Head, 1 Civil Service support staff, 4 special-funded Application/Customer Support Systems Librarians; 2 Electronic Technicians and 1 Systems Librarian supporting networking, data communication, terminals and all microcomputer-based systems; 2 Computer Specialists and 1 Systems Librarian supporting mainframe operations and programming. In mid-1996 the Library reorganized automation support into the Library Networks & Systems (LNS) Division. The former Systems Office head became Coordinator of the LNS Division and a second unit called Desktop Network Services (DNS) was created. The new DNS department included the 2 Electronic Technicians from Systems and was headed by the former Head of Sinclair Undergraduate Library (which had been decommissioned and most of its collections and staff reassigned to Hamilton Library). In June 1996 the first LNS Head left the Library and the head of DNS began serving as both a department head and as Acting Division Head.

[10] Used with permission of the artist

UNCOVER

UnCover, one of the first easily accessible online article databases, was released in December 1988 to the original members of the Colorado Alliance of Research Libraries. It contained records describing the journals to which the CARL libraries subscribed and their tables of contents. It was among the very first systems to offer fee-based unmediated full document delivery with the release of UnCover2 in fall 1991. In 1993 CARL Systems created the "UnCover Company" as a joint partnership between CARL and the publishing companies BH Blackwell (Oxford, England) and Readmore (New York). The partnership goals were to market UnCover worldwide and develop and improve image transmission technology, user interfaces and database searching.

A House of Representatives Resolution (no. 288) was introduced during the Sixteenth Hawaii Legislative 1991 session "Requesting a Master Plan For Electronic Library Information Services":

> [...] this body requests the University of Hawaii Library in consultation with the State Public Library and the Department of Education school library system, to [... identify] areas where collaborative efforts are most effective and areas which should be handled individually [...]

There was recognition that resource sharing was becoming not only feasible but also important with the growth of automated systems, however collaborative efforts across the three very different state agencies were not yet easily achieved.

The UnCover process was as follows: Current issues are sent to the CARL office as they are published; within twenty-four hours, CARL staff input the tables of contents, with any summaries included there, into the database. The result is a very current and large (over 1,5000,000 items) database covering all fields.[11]

The Library was the first CARL library outside the Rocky Mountain region to contribute periodical holdings to the Uncover system by way of the External Service Program (ESP) that was formed in 1992 with the goal of becoming a self-supporting fee-for-service unit. Administration Executive Policy E2.208 – June 1992 laid out the charge, services and legal aspects of the program. In exchange for keying table of contents for specific journals to which the Library subscribed into the UnCover database and retrieving requested articles, the Library could offer free fax-on-demand document delivery service to University faculty via the UnCover Gateway. The process was described in 1994 as follows:

> More than 2,000 unique titles were selected by the UnCover Company from the UHM collection for inclusion to broaden the database in coverage of Asian language periodicals with English tables of contents. Each night records created in Honolulu travel electronically to Denver for addition to the full UnCover file. The Library serves as a supply site for its unique titles as well as an additional 7,000 titles it owns which are in UnCover. Since offices in the islands on Pacific Standard Time are open after the mainland workday has ended, some late day UnCover requests can be routed to Hawaii for filling.[12]

If the article was in a journal held at another institution, the Library paid a subsidized/discounted fee to CARL and the faculty member could request fax delivery of the article for "free".

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11 Coder, Ann. "CARL at the University of Hawaii" in The Online Catalog Book: essays and examples edited by Walt Crawford, 1992. http://hdl.handle.net/10125/49430

12 Diercks, Thelma "Library Profile: The University of Hawaii at Manoa Library" Against the Grain vol. 6, no. 4, 1994 http://hdl.handle.net/10125/24097

Within the UnCover2 interface at the bottom of an article record a **D** prompted the user to enter Delivery Information. The user could input a credit card number and obtain a faxed copy of the article within 24 hours for a service fee plus copyright fee ($6.50 plus approximately $3.50 in 1992). CARL Systems was one of the first companies to offer SDI (Selective Dissemination of Information) services to a broad audience. Faculty could set up a "profile" within the UnCover system listing the journal titles they were interested in, and receive the table of contents of new issues via email on a regular basis.

In 1997 UHM Library launched a subsidized unmediated ordering function via UnCover, dubbed “SUMO”, in response to the serials cancellations the library had to institute. If a UHM faculty, graduate student or staff/researcher identified an article they wanted which was in a journal/issue not held by the library, they could place an order directly via UnCover and the article would be sent to their fax machine with the cost of the delivery was charged against a library deposit account.

DIGITIZATION

During the 1991 Sixteenth Hawaii Legislative session, a House of Representatives Resolution (no. 245) was introduced "Encouraging the use of computerized archiving of the photographic collections of the State of Hawaii". The final "Whereas" stated:

> if the photographic collections of these three institutions [University of Hawaii, Hawaii State Archives, Bishop Museum] were digitized and linked to UHCARL, the on-line catalog of the University of Hawaii system, these images would be preserved for the future and would be made accessible to users on all islands through the statewide telecommunications network funded by the 1990 Legislature

The Library’s first digitization project involved a photo display system called CARLterm and the Trust Territory Archives (TTA) Index. The TTA is a microfilm record of the files of the U.S. Administration of Micronesia. The index to the archives was converted from an IBM mainframe database into "pseudo-MARC" records and loaded as a separate database subsystem on ALOHA searchable via the same OPAC software. The UHCARL system had built-in support for easily switching between different PAC databases that made the TTA records more accessible.

In 1990 Boulder Public Library began working with CARL Systems programmers to develop software interfaces between digitized images stored on an optical disk system and MARC cataloging records in order to make digitized images of visual materials accessible via the CARL PAC. In 1991 the Library submitted an application for, and was awarded a Title II-C federal grant to undertake a similar digitization project for the TTA photographs linked to the records already available in UHCARL. The system utilized a serial connection to the Tandem and an Ethernet connection to a separate Netware LAN server that was connected to an external magneto-optical storage device. The resulting system was primitive but very exciting for patrons. It worked as follows: the CARLterm Image Display software read the "filename" from a special 530 tag in the MARC record and linked to the image based on the information encoded in the filename in the tag. The PAC program displayed a prompt on the option line at the bottom of records "Image File Available". The user then pressed Alt-F2 and the image was delivered to the screen of the PC workstation.

Following the TTA photograph conversion project, which was grant funded from 1991-1994 and continued through 1998 the Library undertook additional digitization initiatives, such as: Digitizing Hawaiian Language Newspapers on the World Wide Web, 1997 and Project to develop a digital library of Hawaiian and Pacific Islands materials, using Hawaiian-language newspapers and historical photographs, 1998. The Image Server module of Voyager was released in late 2000 and was given a trial at UHM Library but was ultimately not implemented. This was in part because use of the module would extend "cataloging" functions to staff outside the technical services unit which was not permitted by the Collection Services Division Head. The software was also found lacking in features that would be useful for the wide range of image collections planned for the future or already made available online[13].

A Senate Resolution (no. 132) was introduced in the Eighteenth Legislature in 1996 "Requesting the Coordination of Efforts to Make University of Hawaii Library Collections Available on a Systemwide and Statewide Basis Through Modern Distributed Digital Storage Systems and Telecommunications Technologies"; the University of Hawaii at Manoa libraries in partnership with the libraries throughout the University of Hawaii system and the University's Information Technology Services Division were asked to make a plan and a proposal to achieve the request. The February 1997 Report to the 1997 Hawaii State Legislature[14] laid out an ambitious upgrade and expansion plan tied to the 1996 UHM Library Strategic Plan.[15]

The Library implemented online access to print reserves by working with CARL to develop the Reserve module of UHCARL in 1995-1996. By 1997 all of the items placed on reserve at Sinclair library could be searched online by class or instructor name. In 2002 Sinclair library implemented *electronic* reserves, providing access not only to an index of class reserve material but delivering the items electronically to students.

MEDIA BOOKING

One of the application modules CARL Systems was contracted to provide was an online media booking system, however by late 1996 it was clear that they would not meet that obligation. The Library began to investigate standalone alternative systems to be used by the Sinclair Library Wong Audiovisual Center to handle bookings for their film viewing rooms and individual viewing stations. In lieu of a CARL materials booking system, the UHM Library agreed to consider the Medianet system from Dymaxion of Nova Scotia, Canada. The system was installed in spring 1997. Specifications for export and loading of UHCARL patron and bibliographic records were finalized in May 1997 and a VMS-based DEC Alpha server was installed. Training was held in July, at which point a number of discrepancies in the product as it was configured and the CARL contract for a media booking system were discovered. Five months ensued of "tweaking" output to the Medianet database and to implement public access options including a Web interface and remote telnet access via a PAC menu option. The Medianet system went "live" in December 1997.

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[13] Considering Image Server at the University of Hawaii http://hdl.handle.net/10125/49509
[14] Report to the 1997 Hawai'i State Legislature RE: S.R. No. 132 http://hdl.handle.net/10524/57018
[15] http://web.archive.org/web/20150910121726/http://libweb.hawaii.edu/intranet/library_strat_plan.html

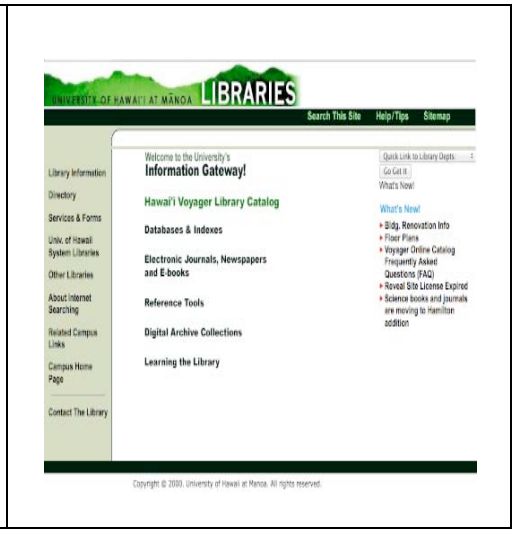
WEB SITE

In April 1996 the Library unveiled its first web site hosted on the ITS campus server; in 2001 the web site was revised and hosted on the Library's web server and in 2006 the web site was completely revised a third time after recovering from the 2004 flood. The website was converted to HTML5 mobile device compatible "responsive" formatting in 2015. Library website versions:

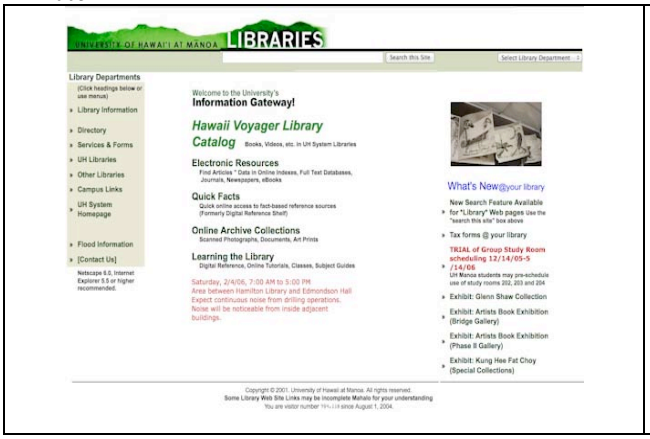
1998

1999

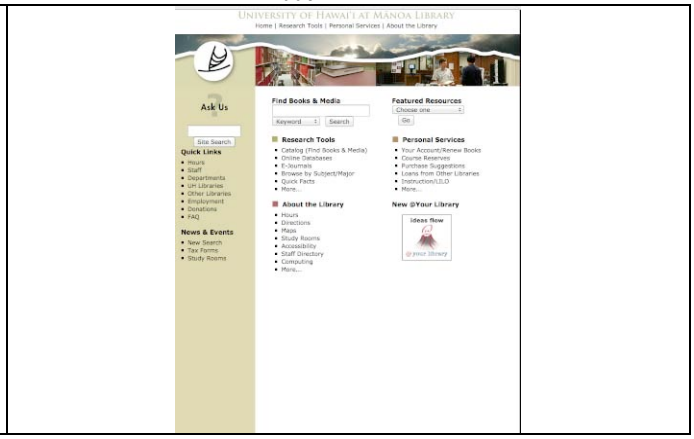
2001



2005

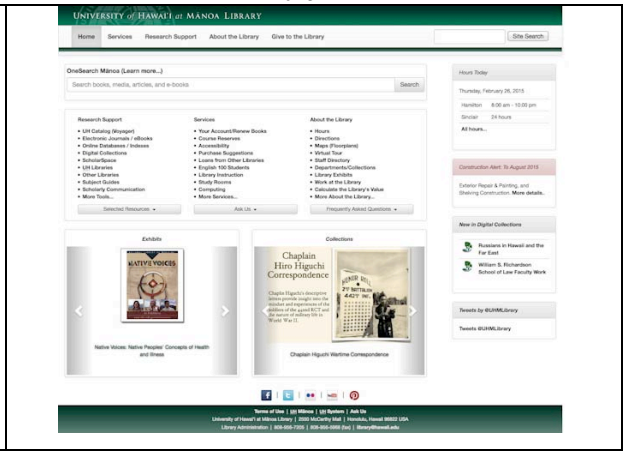


2006



2012

2015



VOYAGER

With the year 2000 approaching and "Y2K" the focus of IT across the globe came the realization that many of the modules (e.g. electronic reserves, media booking) and functionality (e.g. Unicode CJK cataloging and OPAC search) promised by CARL in the contract for services with the Library were not ever likely to come to fruition. It was almost certain that the code revisions and database upgrades to the UHCARL system in order to accommodate Y2K and switch to a GUI interface for the public catalog would cost as much as buying a new Library Management System (LMS).

In order to insure that the next LMS successor to UHCARL would come "turn key" with all desired modules and functions an extensive set of rating criteria were created as part of a complex Review of Library Systems (ROLS)[16] process which involved nearly all of the Library staff and representatives from all UH system libraries. The University Librarian established a Library Steering Committee which consisted of "conveners" for specialized library functional areas: system technology and operations, technical processing services, access services (including interlibrary loan, circulation, booking, reserves) and the online public interface. In late 1998, the functional area committees created lengthy and detailed tables of specifications. The specifications were many pages long for every module; a sample of the Circulation requirements began with:

1. CIRCULATION
1.1 OVERALL FUNCTIONS:
1.1.1 Circulation transactions occur in real time – patron and item statuses are immediately updated.
1.1.2 Circulation module is fully integrated with the PAC module (e.g. able to search PAC without logging out from Circ module; Circ transactions update dynamically in PAC display).
1.1.3 Able to scroll backward and forward in browse lists (of transactions, patron names, financial histories, etc.).
1.1.4 Able to access all circulation functions while in an individual function (e.g., patron's current transactions/history from Charge function)
1.1.5 System accommodates our existing barcode format and data
1.1.6 Able to re-execute a previous search for items or patrons without rekeying.
1.1.7 Operator alerts may be:
1.1.7.1 visual
1.1.7.2 sound
1.1.7.3 combination of visual and auditory cue.

and ended 8 pages later with:

1.9 ADDITIONAL FEATURES:
1.9.1 An online backup function is available when main circulation module/function is "down" or otherwise inaccessible, for example in event of system failure.
1.9.2 An inventory/in-house usage tracking system is offered as an added feature or option.

The checklists and specifications were used to create official "Request for Proposal" (RFP) criteria in the form of a tables which were sent in early 1999 to major library system vendors of the time, including Innovative Interfaces (III), Ex Libris, CARL and Endeavor. Responses were reviewed by module committees and given ratings.

[16] See: https://web.archive.org/web/20060407235812/http://libweb.hawaii.edu/intranet/rols/rols_old.html

The first page of the 32-page combined Access Services module form looked like this:

Access Services Requirements (____% of total points)
Minimum and Mandatory Requirements

Item	Specification	Yes	No	Expected Release
Date				
1.0.1	Allows use of unlimited number and combinations of parameters[1] which may vary within an institution or across multiple institutions.			
1.0.2	Provides an online backup function when main Circulation module/function is "down" or otherwise inaccessible.			
1.0.3	Allows access to patron financial history online in real time and stored as archived audit trail.			
1.0.4	Correctly calculates and recalculates due dates and fines under all circumstances irregardless of modifications that have been applied to the transaction[2].			
1.0.5	Permits the creation of temporary transaction records in real time in order to charge out items which are not fully cataloged (i.e. "circulation on the fly")			
1.0.6	Patrons may view information about their circulation transactions[3] in the online catalog from any physical point of access to the system			
1.0.7	Patrons may place requests to hold or page items by means of the online catalog from any physical point of access to the system.			
2.0.1	Reserve functions are fully integrated[4] into "standard/normal" Circulation function/module			

[1] e.g. loan periods, borrower categories, format/material type, collection/location, fine structures, privilege blocking thresholds

[2] e.g. modifications might include one or more of the following: item may have a hold/reserve request placed on it, a recall placed, a system or manually recalculated due date applied, the return date "backdated", a lost status applied, etc.

[3] Minimally defined as: personal identification information (address, phone number); items charged out, overdue, lost, on hold for them, recalled from them; number, type and amount of outstanding financial obligations.

[4] e.g. all Circ functions appropriately applied to Reserve transactions work in the same way and are performed using the same commands; separate logins, duplicate data entry, etc. not required

Based on the ROLS committees review rankings, six vendors (Ameritech, Endeavor, GEAC, Innovative Interfaces, Ex Libris and CARL) were invited to make onsite presentations and perform demonstrations of their systems for Library staff. Ex Libris had the most Unicode compliant system (Aleph 500) however the company was very new to the North American market and didn't have modules for every function the Library wanted to automate. Endeavor bid to provide a full client/server system (Voyager), had a GUI interface already deployed and offered more flexibility for customization of features for different libraries in the UH system. An Image Server module for digital collections was under development. The Voyager system ran on well-known Sun Microsystems servers using a version of the widely used Unix operating system. In late 1999, the final decision was made by the ROLS steering committee and Library administration based on the strengths of Endeavor's Voyager including the fact that Endeavor had the largest customer base of academic research libraries. The first Voyager system consisted of a database server running on a SunFire Enterprise 4500 and an application/web server on a SunFire 450.

The Voyager system required staff to all have microcomputers to use the cataloging, serials, acquisitions and other technical services and systems functions. For the first year of implementation the public interface continued to be terminal based while a committee designed the WebPAC and each UH system library decided on customized display and functionalities. Public terminals were replaced with PCs and in January 2001 the WebPAC went live. In March 2000 Endeavor Systems was purchased by Elsevier and in November 2006 was purchased from Elsevier by Ex Libris. A Unicode-compliant version of Voyager was released and implemented in May 2005.

SELF-CHECKOUT

The idea of acquiring an automated "self checkout" system was first put forward in a campus Centennial Campaign proposal to "allow users to check out materials by themselves. They would not have to go to the Circulation Counter to have items checked out to them by Library staff. This could eliminate the need for patrons to wait in line to complete their transactions." In early 2007 funding was allocated to buy a 3M Selfcheck system. In June 2007 a "soft launch" took place when the system was installed and connected to Voyager; a "hard launch" followed on July 3rd. The system was publicized as a way for the Library to accommodate extended evening hours without adding additional evening circulation staff. In May 2009 a second 3M Selfcheck station was installed in Sinclair Library replacing a "home made" PC-based system.

In July 2011 a former UH Manoa student was arrested for stealing more than 200 books from Hamilton Library by exploiting a flaw in the design of the self check system which can be used to desensitize 2 books while checking out only one (even though the model was set to detect multiple books on the desensitizer bed). The Hamilton Library station was turned off and removed after component replacement and settings reconfiguration could not completely eliminate the ability to desensitize more than one item in a checkout transaction.

INFORMATION TECHNOLOGY EXPANSION

In early 1994 the Library had approximately 130 microcomputers mostly for staff as well as for public use with CD ROM database systems and 82 dot-matrix, non-networked printers. By October 2001, there were over 450 microcomputers, almost 200 of which were for public use as well as networked laser printers available to all staff and patrons to print online catalog, electronic database and web search results.

In June 1999 the DNS department head moved full time to become Head of the newly renamed "Library Information Technology" (LIT) Division and one of the two remaining permanent librarians from the Systems Office became the new DNS department head.

In late 2000 the University of Hawai'i campus began an "IT Demonstration Project" that involved major reworking of job descriptions and classifications for computer support positions. Thanks to Y2K and the exponential growth of the early web, the UH System Office of Human Resources needed to address the serious problem of finding and retaining IT staff on campus. The first online personnel system was implemented as part of the project to facilitate and bring consistency to the classification and salary decisions (i.e. to find a way to pay IT staff the going rate and "opportunities for monetary rewards for ... exceptional performance" which had not been easy to accomplish within the former Civil Service system).

In response to the growing ubiquity and necessity of microcomputers to perform library functions, PC-based productivity applications (e.g. Microsoft Office), desktop/office printing, increased access to electronic resources online via the World Wide Web and the opportunity provided by the IT Demonstration Project, the Electronic Technician positions in the Library IT Division were converted to the recently created classification of Information Technology Specialists.

The Library had been unsuccessful in filling the position of (AUL-POA) after the retirement of the incumbent in 1995. In 1996, the former duties of the AUL-POA that related to cataloging, serials, acquisitions and other technical services were undertaken by a faculty Division Head for Collection Services. The AUL-POA position was "frozen" for two years because of state and university budget shortfalls. Advertising in 1997 and 1998 did not result in filling the position. In 2001 the Library was able to complete a redescription of the AUL-POA position to AUL for LIT and reclassification from Associate to Assistant level. In 2002 the Library advertised for applicants for the position of Assistant University Librarian for Library Information Technology and in May 2003 the first AUL-LIT joined the Library.

WIRELESS

In August 2001 the Head of LIT informed the Division and Library administration by email:

> Authenticated, wireless access to the campus network in the libraries and connection of the libraries to the "Next Generation Campus Network" (switched/multicast/redundant/QofS/VPN network capability) should be a reality by August 15, 2002. This is part of the Manoa Information Technology Committee's recommendations that will be forwarded to the chancellor soon.

By the end of 2001, ITS had the central infrastructure in place, however they did not receive any additional funding to expand the wireless network so if departments wanted to get connected they had to purchase wireless access point (WAP) equipment from their own funds. The Library began purchasing WAP and installing them in large open areas; the first installation was in Sinclair Library Reserve Bookroom in February 2002. By the end of 2002 there was wireless access in at least one public open space on every floor of Hamilton and Sinclair libraries. In addition, new furniture in Hamilton Library that had built-in electrical and data outlets were configured to provide "wired wireless". This allowed users with laptops, but without a wireless card, to connect using an Ethernet cable to ports that were routed through to the ITS wireless network. In February 2010 ITS informed the library that they could no longer provide service to the "wired wireless" connections because the device was no longer supported (the unsupported function continued to run until early 2011). Requests for ability to print from wireless connections began almost immediately but a feasible and affordable solution did not present itself until 2010 when the Library acquired and installed the PrinterOn web-based system.

DEBIT PRINTING

In early 2000 the Library began investigating debit printing systems for the public PCs—subsidizing the exponentially increasing amount of printing was becoming impossible as the budget decreased. Cost-recovery became the watchword. A system that would be easy to maintain, produce management reports required by the Fiscal Office and function with the Library DANYL card readers was needed. In August a sole-source purchase request for GoPrint was submitted and the first server and paystations were installed in Hamilton Library at the end of October. The first install site was in the Science/Technology reference department of Hamilton Library. Eventually there would be 5 paystations in Hamilton and 2 in Sinclair Library. ITS would also adopt the system for use in their campus computer labs.

OPENURL

The AUL-LIT presented an IT Vision Statement in July 2003 with plans to use IT to expand library services to "focus upon access as well as collections" and "rethink provision of services to play more dynamic roles within the university". Implementation of OpenURL was an outcome of the first vision.

A large group of Library faculty and staff participated in a series of reviews of products from four different OpenURL producers in November and December 2003. In March 2004 the Library signed a contract with Serials Solutions for their OpenURL system. A team with members from the Serials and DNS department was assembled to implement OpenURL by building the database, preparing public interface displays and developing policies. The system was launched in the summer in order to work out any bugs and allow reference staff to prepare instructional material before the start of fall semester 2004.

INSTITUTIONAL REPOSITORY

The AUL-LIT expanded upon the 2003 vision that "the rise of digital collections and advanced technologies for creating transparent interfaces to information and services" provided an opportunity for library services to "focus upon access as well as collections" and to "preserve at risk materials" in a 2006 development "case statement". The proposal was for creation of a Digital Scholarly Repository program "for works held and created by the University of Hawaii [...] digital and digitized reports, maps, music, video, and still images [...] to preserve rare, historical and culturally significant materials while still providing access to those materials to researchers, students, and the general public." Even though no external funding source was secured, UHM Library installed dSpace, an open source repository software package, in mid-2006. This was the start of a highly successful Library Institutional Repository initiative. Scholarspace was soft-launched in 2007 as policies, Memoranda of Understanding (MOU) and logistics were refined. Harvesting by OAIster began in January 2008. In June 2009 a second dSpace repository, eVols, for digital collections was launched and a third, UH System libraries repository, in July 2011.

DISASTER

A devastating flood hit the University campus on October 30, 2004 and destroyed the entire basement of Hamilton Library. Electrical transformers serving the Library exploded. All the power conditioning, chiller, fire suppression systems and equipment as well as the servers in the computer room and all telecommunications equipment and connections were destroyed. Starting early the next morning recovery of computer equipment began; drives from server systems were sealed in plastic bags and mailed to Ontrack Data Recovery Services. Staff PCs were pulled from the wreckage as they were unearthed and drives were sent to Super Geeks to attempt to recover them, some of the drives which Super Geeks could not recover were later sent to Ontrack but very little could be salvaged. The disaster recovery firm BMS Cat (BMS Catastrophe) eventually bull dozed and removed nearly everything from the basement, including all the equipment, systems, flooring, conduit, etc. from the computer room which was not pulled out in the first few days after the flood.

Flood damage photos

A vacant campus telecommunication room in the basement of Sinclair Library was hastily recommissioned for use as a temporary server room. DNS moved a switch and firewall from undamaged parts of the Library and established a network connection for the Voyager servers. By the first week of November access to online e-resources restored by setting up a replacement proxy server loaded with a system backup in the Sinclair basement. Campus Information Technology Services (ITS) activated a network connection to the telecomm room in the ground floor of the undamaged Addition and a switch was installed which became the new temporary network hub for Hamilton Library. When generators were brought in, the Hamilton first floor telecomm room was reconfigured to connect to the new hub in the Addition. This was accomplished by stringing cat5 cable between the two closest datajacks in each location. In March 2005 a temporary fiber connection was put in place between the two telecomm rooms.

Recovered Library web server files from Ontrack were copied onto a temporary server created by repurposing a DNS staff computer. Using a combination of backups, copies left on work PCs, and the Internet "Wayback Machine" most of the files that could not be recovered from the damaged server were restored.

Emergency server replacement equipment (database server: SunFire V880, application/web server: SunFire 280R) provided at no charge by Sun Microsystems was installed in the Sinclair basement and the Voyager system was restored from off-site backup tapes. Replacement computers for Collection Services and Government Documents/Maps staff arrived in December 2004 and were installed and networked in temporary locations in Hamilton and Sinclair.

The Systems Office was able to use the free Sun server and equipment until March 1, 2005 at which point it had to be returned under the terms for emergency assistance. The Library used FEMA funding to purchase a SunFire V890 for the Voyager database server and a SunFire V480 for the Voyager application/web Server. Later in 2005/06, the Systems Office also purchased using FEMA funds a Sun Fire X4500 with over 2 terabytes of storage space as a replacement for the flood-destroyed Tandem hardware.

In June 2005 the design process to create a new server room began when two design firms were interviewed. In March 2006 the AUL-LIT reported to the Library:

> After the 2004 floor, Systems and DNS were able to restore most major systems rapidly. However, because of the extent of the flood, a number of primary backups were lost; data stored on individual PCs, and not backed up, were lost. We are working on cost-effective approaches to strengthening our overall backup and recovery systems. First, we will be implementing a Library Intranet which will serve as a location for commonly used digital resources and collaborative e-projects. ... We are investigating an off-site location for storage of backup tapes to prevent losses in the case of a possible valley-wide disaster. While our old disaster recovery plans were highly effective, we have learned a great deal from the flood and want to rebuild our facilities and our procedures stronger than before.

In 2005 DNS purchased new servers with FEMA funding and distributed them in vacant telecomm rooms on all floors of the Hamilton Addition. It was not possible to put more than a few units in any one room because the rooms did not have adequate ventilation or cooling. All of the servers were reunited in one rack when DNS moved into the completed new server room in November 2009.

The Library joined the Greater Western Library Alliance (GWLA) consortium in January 2005 to participate in programs related to scholarly communication, interlibrary loan, shared electronic resources, cooperative collection development, digital libraries. To address the growing issue of tracking of work requests as a result of the disruptions and relocations after the flood, DNS implemented the WebHelpDesk (WHD) in February 2005 to expedite disaster-related support of staff and public IT equipment and services.

The AUL-LIT position became vacant effective July 2007 when the incumbent left to take another position in another state. By 2008, the Systems Office maintained and supported the Hawai'i Voyager system for 10 libraries in the University of Hawai'i System, the Bishop Museum, the Hawai'i Medical Library, and the Hawai'i State Archives. The Systems Office and the Voyager server equipment moved out of the "temporary" Sinclair Library quarters into a new server room on the second floor of Hamilton Library in December 2009.

From September 2007 through January 2010 the head of DNS also served as the Acting Head for the LIT Division. In January 2011 the former Acquisitions department head was appointed Acting AUL-LIT.

In August 2011 at a "State of the Library" presentation the Acting AUL-LIT announced that Ex Libris had declared the current library server at "end of life" and that she would be "coordinating a conversation" in response to this information. In late 2011 a contract between the University of Hawai'i at Manoa Library and Ex Libris was signed and in February 2012 UH system-wide library staff were informed that:

> The UH Library Council recently made several decisions:
> 1. To continue with the Ex Libris Voyager library management system
> 2. To replace the Voyager server and not migrate to "cloud" services
> 3. To sign an agreement for a 3-year contract for Primo, Ex Libris's discovery and delivery tool

The Library purchased new server equipment (database server: HP Proliant DL980 G7, application/web server: HP Proliant DL360 G7) in 2011 in anticipation of the increased computing power needed for the Primo system. A phased installation of SFX and Primo was planned for June through December 2012, with public implementation to follow. Ex Libris featured UHM Library in a June 2012 press release (http://www.exlibrisgroup.com/press-release/the-primo-community-exceeds-1000-sites-as-the-university-of-hawaii-system-selects-ex-libris-discovery-and-delivery-solutions)

A Primo UI (User Interface) configuration team consisting of 4 public service librarians was formed to make decisions about OneSearch menus and functionality. The UI team worked with with ExLibris staff and the Library Systems Office to create the initial set-up. The UI team compiled a document of library staff feedback relating to the initial interface configurations.

On January 23, 2013 the chair of the UI team reported:

> […] I wanted to provide a few final notes on the recent work of the User Interface Configuration Team.
> 1. The ExLibris Primo product has much to offer, but certainly has room for improvement. Interface tweaks and improvements that are within the library's control (under the current subscription contract) will continue to be made […] more significant product development requests will be forwarded to ExLibris […]
> 2. The Primo User Interface Configuration Team submitted its final instructions and configuration requests last week. […] After those new instructions were submitted, the Primo User Interface Configuration Team handed the product back to the Systems Department.
> 4. FYI - Three primary issues need to be mentioned as we begin to use the product with patrons
> **- Hawaii Pacific Journal Index**
> The UI team submitted instructions to have HPJI removed (temporarily) from OneSearch […] At present, HPJI search results point to incorrect Voyager Catalog records when a user clicks on "This item in the Library Catalog" within the Details tab.
> **- Intrasystem Loan Requests**
> Currently, when you try to request an item from another UH campus, you get the following error message -- "You are not authorized to place requests for this record." […] the UI team submitted instructions to have that error message changed to something like, "This feature is currently unavailable. Please use the classic catalog (Hawaii Voyager) if you are trying to transfer an item between campuses. We are working to fix this technical issue."
> **- Start date, End date limits in Advanced Search**
> Version 4 of Primo added the Start date/End date limit feature to the Advanced Search screen. At present, it does not work with Voyager data feeds.

On January 30, 2013 the Interim Public Services Division Head reported:

> The UHM Library will launch OneSearch Manoa (aka Primo) on **Friday, February 1**. […]The search box for the Voyager catalog, labeled Find Books and Media, will be replaced with a OneSearch Manoa search box on the Library's home page. There will still be a link to Voyager under Research Tools. A "friendly" URL has been devised for OneSearch: http://onesearch.lib.hawaii.edu. A LibGuide about OneSearch[17] is being readied and will also be published on Friday.

[17] Original 2013 version: http://web.archive.org/web/20130220112940/https://guides.library.manoa.hawaii.edu/onesearch

3/16/88
Bruce L. Park
<GATEWAY.4>

Hawaii INC

Gateway to the World

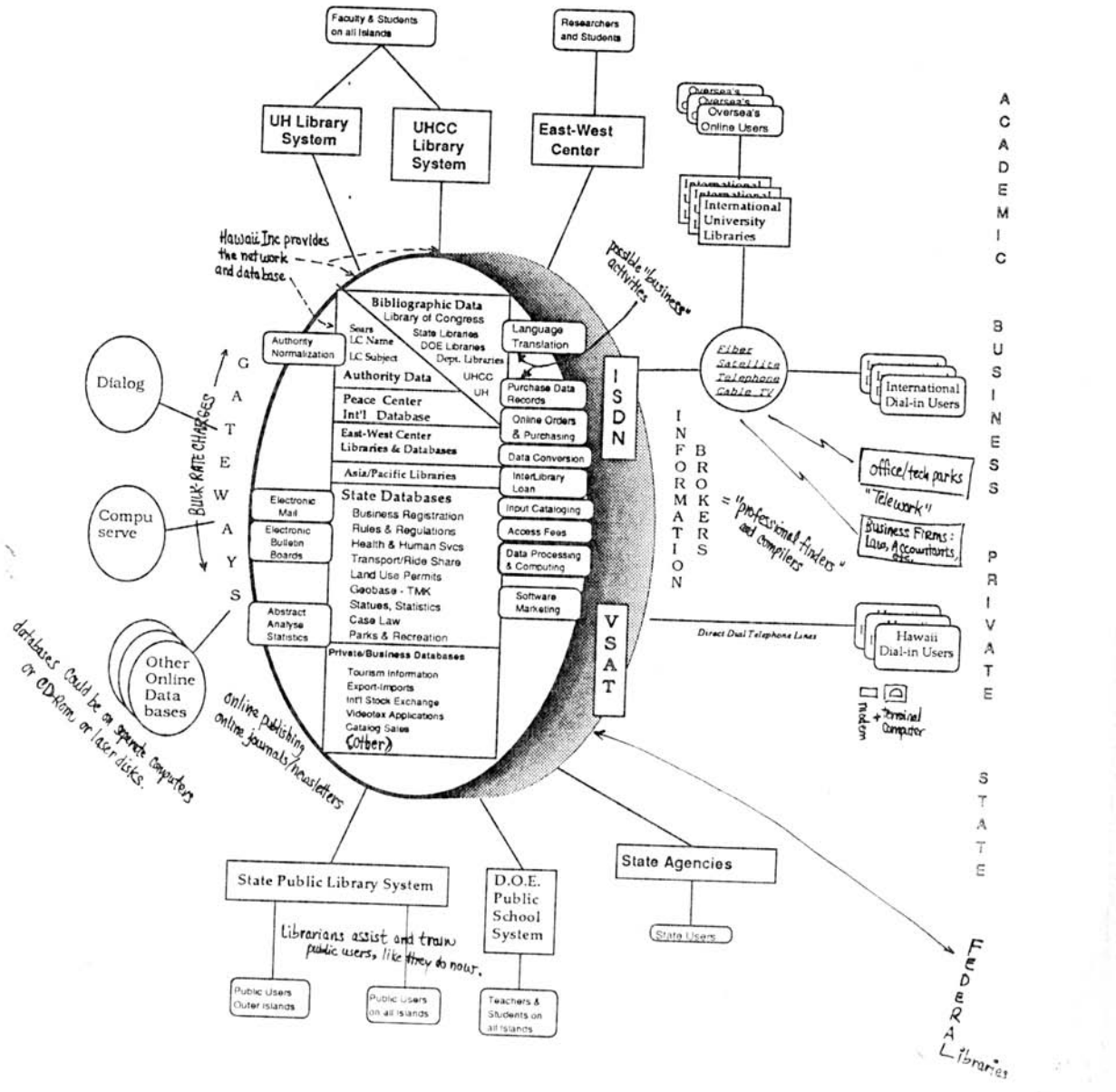


Figure1

Title	Dates
Library Director	
Carl Stroven	1943-1966
Dean of Library Activities	
Shaw, Ralph	1966-1969
University Librarian	
West, Stanley	1969-1977
Bosseau, Donald	1977-1982
Harris, Ira (Acting) and Stevens, Robert (Acting)	1982
Haak, John	1983-2000
Ehrhorn, Jean (Acting)	2000-2001
Perushek, Diane	2001-2006 Sept
Mochida, Paula (Acting then Interim)	2007-2011
Geary, Gregg (Interim)	2012-2013 June
Herold, Irene	2013 Aug-2017 June

Associate University Librarian for Planning, Administration and Personnel	
Ehrhorn, Jean	1987-2004
Mochida, Paula (Interim)	2006-2007 Mar
Assistant to the University Librarian	
Ehrnorn, Jean (part-time)	2007-2008
Grosenheider, Alan	2009-2010
Grosenheider, Alan (Interim)	2010 Sep-2012 June
Weber, Susan (Interim)	2012 July-2013 June
Sinclair, Gwen (Interim)	2013 Aug-2014 Dec
Ghosh, Monica (Interim)	2015 Jan-May
Crawford, Ann	2015 May-2016 June
Ghosh, Monica (Interim)	2016 Nov-2017 Aug

Associate University Librarian for Public Services & Collection Development	
Putnam, Lee	1978?-1984
Division Head, Public Services	
Paula Mochida	1993-1999
Hensley, Randy	1999-2005
Frost, Wil	2007-2010
Nakano, Kim (Interim)	2011-2012
Sinclair, Gwen	2013
Sung, Jan	2014
Lebbin, Vickery	2014-2017

Associate University Librarian for Processing, Operations & Automation (POA)	
MacMillan, Gary	1981-1994
Division Head, Collection Services	
Schaafsma, Carol	1994 Oct-1999 Apr
Winjum, Roberta (Interim)	1999 Jun-2000 Aug
Bruner, David	2004-2006
Anderson, Kris (Acting)	2006-2007
Carlson, Amy (Acting)	2010-2012
Carlson, Amy	2012-
Coordinator, Library Systems & Networks Services	
Naj, Linda	1995-1996 August
Division Head, Library Information Technology	
Frost, Wilson (Interim)	1999 Sept-2001
Chantiny, Martha (Acting)	2007 Sept-2010 Feb
Assistant University Librarian for Library Information Technology	
Schwarzwalder, Robert	2003 May–2007 July
Nakano, Kim (Interim)	2011-2013 June
Tillinghast, Beth (Interim)	2014-2015
Yeh, Sheila	2017 March -

Library IT departments

Head, Systems Office	
Quirk, Ruth Marie	1982-1992
Naj, Linda (Unofficial Acting)	1991-1992
Naj, Linda	1993-1994 June
Chantiny, Martha (Acting)	1994 July-Dec
Vargo, Jackie (Acting)	1995
Adamson, James	1996-
Head, Desktop Network Services	
Frost, Wilson	1995-1999
Chantiny, Martha	1999-2016
Tillinghast, Beth	2016-